

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Todd W. Galinski (Reg. No. 51,713) on March 9, 2009.

The application has been amended as follows:

In the claims:

1. (Cancelled)

2. (Currently Amended) A liquid, 100% solids, non-self fluxing, one-part underfill composition, consisting essentially of:

from 5% to 30% by weight of a photocurable component containing no acidic groups, said photocurable component comprising one or more ethylenically mono-unsaturated monomers having at least 6 carbon atoms, oligomers thereof, or combinations thereof,

from 10% to 45% by weight of a polyfunctional epoxy resin,

from 0.3% to 3% by weight of at least one photoinitiator,

from 40% - 70% by weight of a non-electrically conductive filler,

from 1% - 3% by weight of a non-fluxing latent thermal accelerator,

said underfill in the thermoset state exhibiting a flexural modulus of from 1000 to 5000 MPa at 20°C, and a coefficient of thermal expansion below its glass transition temperature of from 15 to 50 ppm/°C.

3-7 (Cancelled)

8. (Currently Amended) The underfill composition according to claim 2 wherein said one or more ethylenically mono-unsaturated monomers are selected from the group consisting of vinyl esters, vinyl ethers, α,β -unsaturated acrylate esters, and mixtures thereof.

9. (Currently Amended) The underfill composition according to claim 2 wherein said one or more ethylenically mono-unsaturated monomers having at least 6 carbon atoms are acrylate monomers.

10. (Currently Amended) The underfill composition according to claim 9 wherein said acrylate monomers include at least one compound selected from the group consisting of C₃-C₁₂ alkyl esters of acrylic acid and C₃-C₁₂ alkyl esters of C₁-C₄ alkyl-substituted acrylic acid.

11. (Currently Amended) The underfill composition according to claim 2 wherein said one or more ethylenically mono-unsaturated monomers include at least one compound selected from the group consisting of butylacrylate, ethylmethacrylate, butylmethacrylate, t-butyl methacrylate, cyclohexyl methacrylate, trimethylcyclohexylmethacrylate, cyclic ether acrylates, monocyclic

acetal acrylate, acetoacetoxyethyl methacrylate, 2- acetoacetoxyethyl acrylate, 2- acetoacetoxypropyl methacrylate, 2- acetoacetoxypropyl acrylate, 2- acetoacetamidoethyl methacrylate, 2- acetoacetamidoethyl acrylate, 2- cyanoacetoxyethyl methacrylate, 2- cyanoacetoxyethyl acrylate, N(2- cyanoacetoxyethyl) acrylamide, 2- propionylacetoxyethyl acrylate, N(2- propionylacetoxyethyl) methacrylamide, N-4- (acetoacetoxybenzyl) phenylacrylamide, ethylacryloyl acetate, acryloylmethyl acetate, N- ethacryloyloxyethylacetamide, ethylmethacryloyl acetoacetate, N- allylcyanacetamide, methylacryloyl acetoacetate, N(2-methacryloyloxyethyl) cyanoacetamide, ethyl-a-acetoacetoxy methacrylate, Nbutyl-N- acryloyloxyethylacetamide, monoacrylated polyols, monomethacryloyloxyethyl phthalate, and mixtures thereof.

12. (Currently Amended) The underfill composition according to claim 2 wherein said oligomers of the ethylenically mono-unsaturated monomers contain at least one pendant or terminal ethylenic unsaturated group.

13. (Currently Amended) The underfill composition according to claim 12 wherein said oligomers of the ethylenically mono-unsaturated monomers contain two terminal unsaturated groups.

14. (Currently Amended) The underfill composition according to claim 12 wherein said oligomers of the ethylenically mono-unsaturated monomers have an average number of one to

two unsaturated groups and a MW from 500 to 3000.

15. (Currently Amended) The underfill composition according to claim 2 wherein said oligomers of the ethylenically mono-unsaturated monomers are selected from the group consisting of bis-phenol-polyether acrylates, vinyl ether capped oligomer, acrylated epoxy resin, ethylenically unsaturated polyalkylethers, poly(cyclic) ether acrylates, polycyclic (ether) acetal acrylate, urethane acrylate oligomer, and mixtures thereof.

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DETAILED ACTION

Pending Claims

Claims 2 and 8-15 are pending.

Response to Amendment

1. The rejection of claims 5 and 6 under 35 U.S.C. 112, second paragraph, has been rendered moot by the cancellation of these claims.
2. The rejection of claim 1 under 35 U.S.C. 102(a) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Ma et al. (US 2003/0141592 A1) has been rendered moot by the cancellation of this claim.
3. The rejection of claim 1 under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Forray et al. (US 2004/0102566) has been rendered moot by the cancellation of these claims.

Response to Arguments

4. In light of Applicant's amendment and the Examiner's amendment, Applicant's arguments, see pages 5-6 of the response, filed December 22, 2008, with respect to the teachings of Ma et al. (US 2003/0141592 A1) have been fully considered and are persuasive.

The Examiner agrees that the prior art teachings lack the specificity to anticipate or render the instant invention obvious. Ma et al. fail to reasonably teach or suggest the instantly claimed *weight proportions* of the instantly claimed composition. Without these weight

proportions, they also fail to inherently or obviously satisfy the instantly claimed flexural modulus and CTE. The following rejections have been withdrawn:

- The rejection of claim 2 under 35 U.S.C. 102(a) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Ma et al. (US 2003/0141592 A1);
- The rejection of claims 3 and 4 under 35 U.S.C. 103(a) as being unpatentable over Ma et al. (US 2003/0141592 A1) in view of Sakuyama et al (US 2003/0080397 A1);
- The rejection of claims 5 and 6 under 35 U.S.C. 103(a) as being unpatentable over Ma et al. (US 2003/0141592 A1) in view of Yamamura et al. (US Pat. No. 6,287,745).

Comments Regarding the Examiner's Amendment

5. The Examiner's amendment addressed the following issues:

- Independent claim 2 has been amended to include three essential limitations to the instant invention:
 - The photocurable component contains *no acidic groups*. This is discussed in paragraph 029 of the specification (*see paragraph 0030 of the pre-publication*).
 - The photocurable component comprises ethylenically mono-unsaturated monomers and/or oligomers derived from ethylenically mono-unsaturated monomers having *at least 6 carbon atoms*. This is discussed in paragraph 032 of the specification (*see paragraph 0032 of the pre-publication*).
 - A *non-fluxing latent thermal accelerator* is essential to the dual-stage underfill of the instant invention. Evidence of this is found paragraphs 020, 029, and 030 of the specification (*see paragraphs 0022, 0030, and 0031 of the pre-publication*).

- Claim 7 has been cancelled because this essential limitation is now featured in claim 2.
- Claim 8 has been modified: to be dependent from claim 2 (previously dependent from claim 7); and to improve clarity.
- Claim 9 has been modified: to be dependent from claim 2 (previously dependent from claim 8) because *acrylate monomers* properly further limit the monomers described in claim 2; and to improve clarity.
- Claim 10 has been modified to improve clarity – see paragraph 037 of the specification (*see paragraph 0037 of the pre-publication*).
- Claim 11 has been modified to be dependent from claim 2 (previously dependent from claim 10) because not all of these materials fall within the scope of acrylates.
- Claims 12-14 have been modified to improve clarity.
- Claim 15 has been modified to be dependent from claim 2 (previously dependent from claim 14) because these oligomers are not necessarily required to feature limitations of claim 14.

Allowable Subject Matter

6. Claims 2 and 8-15 are allowed.

Communication

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael J. Feely whose telephone number is (571)272-1086. The examiner can normally be reached on M-F 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Y. Pyon can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Michael J Feely/
Primary Examiner, Art Unit 1796

March 9, 2009